

CLAIMS

1. Apparatus for enhancing digital audio signals after the digital audio signals are compressed and decompressed, the apparatus comprising:

an input terminal for receiving a digital decompressed audio signal;

a digital harmonic enhancer coupled to receive the digital decompressed audio signal and provide a harmonically enhanced audio signal;

a digital warmth adder coupled to receive the digital decompressed audio signal and provide a warmth enhanced audio signal; and

a digital frequency equalizer coupled to receive the harmonically enhanced audio signal and the warmth enhanced audio signal and provide a digital enhanced decompressed audio signal.

2. Apparatus as claimed in claim 1 wherein the digital compressed audio signal and the digital decompressed audio signal includes an MP3 format.

3. Apparatus as claimed in claim 1 wherein the harmonic enhancer includes a digital amplifier coupled to provide harmonic distortion.

4. Apparatus as claimed in claim 3 wherein the harmonic enhancer includes a digital high pass filter coupled to receive the digital decompressed audio signal and to provide a digital high pass audio signal to the digital amplifier.

5. Apparatus as claimed in claim 4 wherein the digital high pass filter includes an adjustment for varying a frequency band of the digital high pass audio signal.

6. Apparatus as claimed in claim 4 wherein the harmonic enhancer includes a digital level adjuster coupled to receive the harmonic distortion from the digital amplifier and to provide a level adjusted harmonic distortion audio signal to one input of a digital adder, the digital adder having a second input coupled to receive the digital decompressed audio signal and to add the harmonically enhanced audio signal to the digital decompressed audio signal to produce the harmonically

enhanced audio signal.

7. Apparatus as claimed in claim 6 wherein the digital level adjuster includes an adjustment for varying a level of the harmonic distortion from the digital amplifier.

8. Apparatus as claimed in claim 1 wherein the warmth adder includes a saturated digital amplifier with an S-shaped response curve.

9. Apparatus as claimed in claim 8 wherein the response curve of the saturated digital amplifier includes upper and lower saturation areas which are rounded to provide warmth distortion.

10. Apparatus as claimed in claim 1 wherein the frequency equalizer includes a plurality of adjustments for varying levels of different frequency bands within the harmonically enhanced audio signal and the warmth enhanced audio signal.

11. Apparatus as claimed in claim 1 wherein the digital harmonic enhancer, the digital warmth adder, and the digital frequency equalizer are included in a digital signal processor.

12. Apparatus as claimed in claim 1 wherein the digital harmonic enhancer, the digital warmth adder, and the digital frequency equalizer are provided as software for a digital signal processor.

13. Apparatus as claimed in claim 12 wherein the digital harmonic enhancer and the digital frequency equalizer include adjustments for varying a level of the harmonic distortion and for varying levels of different frequency bands within the harmonically enhanced audio signal and the warmth enhanced audio signal.

14. Apparatus as claimed in claim 13 wherein the adjustments are preset to levels determined by an expert of the received digital decompressed audio signal.

15. Apparatus for enhancing digital audio signals after the digital audio signals are compressed and decompressed, the apparatus comprising:

an input terminal for receiving a digital decompressed audio signal;

a digital harmonic enhancer coupled to receive the digital decompressed audio signal and provide a harmonically enhanced audio signal, the harmonic enhancer including a digital high pass filter coupled to receive the digital decompressed audio signal and to provide a digital high pass audio signal, a digital amplifier coupled to receive the digital high pass audio signal and to provide harmonic distortion of the digital high pass audio signal, and a digital level adjuster coupled to receive the harmonically distorted digital high pass audio signal from the digital amplifier and to provide a level adjusted harmonic distortion audio signal to one input of a digital adder, the digital adder having a second input coupled to receive the digital decompressed audio signal and to add the harmonically distorted digital high pass audio signal to the digital decompressed audio signal to produce the harmonically enhanced audio signal, the digital high pass filter including an adjustment for varying a frequency band of the digital high pass audio signal, and the digital level adjuster including an adjustment for varying a level

of the harmonic distortion from the digital amplifier;

a digital warmth adder coupled to receive the digital decompressed audio signal and provide a warmth enhanced audio signal, the digital warmth adder including a saturated digital amplifier with an S-shaped response curve wherein the upper and lower saturation areas are rounded to provide warmth distortion; and

a digital frequency equalizer coupled to receive the harmonically enhanced audio signal and the warmth enhanced audio signal and provide a digital enhanced decompressed audio signal.

16. Apparatus as claimed in claim 15 wherein the digital harmonic enhancer, the digital warmth adder, and the digital frequency equalizer are included in a digital signal processor.

17. Apparatus as claimed in claim 15 wherein the digital harmonic enhancer, the digital warmth adder, and the digital frequency equalizer are provided as software for a digital signal processor.

18. Apparatus as claimed in claim 17 wherein the digital harmonic enhancer and the digital frequency equalizer include adjustments for varying a level of the harmonic distortion and for varying levels of different frequency bands within the harmonically enhanced audio signal and the warmth enhanced audio signal.

19. Apparatus as claimed in claim 18 wherein the adjustments are preset to levels determined by an expert of the received digital decompressed audio signal.

20. A method of enhancing digital audio signals after the digital audio signals are compressed and decompressed, the method comprising the steps of:

receiving a digital decompressed audio signal;

harmonically enhancing the digital decompressed audio signal and providing a harmonically enhanced audio signal;

adding warmth to the digital decompressed audio signal and providing a warmth enhanced audio signal; and

combining and frequency equalizing the harmonically enhanced audio signal and the warmth enhanced audio signal

to provide a digital enhanced decompressed audio signal.

21. A method as claimed in claim 20 wherein the step of receiving includes receiving a digital decompressed audio signal produced from a digital compressed audio signal using an MP3 format.

22. A method as claimed in claim 20 wherein the step of harmonically enhancing the digital decompressed audio signal includes digitally high pass filtering the digital decompressed audio signal to provide a digital high pass audio signal.

23. A method as claimed in claim 22 wherein the step of harmonically enhancing the digital decompressed audio signal includes digitally amplifying the digital high pass audio signal to provide harmonic distortion.

24. A method as claimed in claim 23 wherein the step of harmonically enhancing the digital decompressed audio signal includes providing an adjustment for varying a frequency band of the digital high pass audio signal.

25. A method as claimed in claim 23 wherein the step of harmonically enhancing the digital decompressed audio signal includes adjusting a level of the harmonic distortion from the digital amplifier and providing a level adjusted harmonic distortion audio signal to one input of a digital adder, coupling a second input of the digital adder to receive the digital decompressed audio signal, and adding the harmonically enhanced audio signal to the digital decompressed audio signal in the digital adder to produce the harmonically enhanced audio signal.

26. A method as claimed in claim 20 wherein the step of adding warmth to the digital decompressed audio signal includes saturation amplifying the digital decompressed audio signal with an S-shaped amplification response curve.

27. A method as claimed in claim 26 wherein the step of saturation amplifying includes producing upper and lower saturation areas which are rounded to provide warmth distortion.

28. A method as claimed in claim 20 wherein the step of combining and frequency equalizing includes providing a

plurality of adjustments for varying levels of different frequency bands within the harmonically enhanced audio signal and the warmth enhanced audio signal.

29. A method as claimed in claim 20 including providing the steps of harmonically enhancing, adding warmth, and combining and frequency equalizing in a digital signal processor.

30. A method as claimed in claim 29 wherein the steps of harmonically enhancing and combining and frequency equalizing include providing adjustments for varying a level of the harmonic enhancing and for varying levels of different frequency bands within the harmonically enhanced audio signal and the warmth enhanced audio signal.

31. A method as claimed in claim 30 wherein the step of providing adjustments includes providing preset levels determined by an expert of the received digital decompressed audio signal.

32. A method as claimed in claim 20 including providing the steps of harmonically enhancing, adding

33. A method of enhancing digital audio signals after the digital audio signals are compressed and decompressed, the method comprising the steps of:

receiving a digital decompressed audio signal;

harmonically enhancing the digital decompressed audio signal and providing a harmonically enhanced audio signal, the step of harmonically enhancing the digital decompressed audio signal including digitally high pass filtering the digital decompressed audio signal to provide a digital high pass audio signal, digitally amplifying the digital high pass audio signal to provide harmonic distortion, and adjusting a level of the harmonic distortion from the digital amplifier and providing a level adjusted harmonic distortion audio signal to one input of a digital adder, coupling a second input of the digital adder to receive the digital decompressed audio signal, and adding the harmonically enhanced audio signal to the digital decompressed audio signal in the digital adder to produce the harmonically enhanced audio signal;

adding warmth to the digital decompressed audio signal and providing a warmth enhanced audio signal including saturation amplifying the digital decompressed audio signal with an S-shaped amplification response curve producing upper and lower saturation areas which are rounded to

provide warmth distortion; and

combining and frequency equalizing the harmonically enhanced audio signal and the warmth enhanced audio signal to provide a digital enhanced decompressed audio signal.

34. A method as claimed in claim 33 including providing the steps of harmonically enhancing, adding warmth, and combining and frequency equalizing in a digital signal processor.

35. A method as claimed in claim 33 wherein the steps of harmonically enhancing and combining and frequency equalizing include providing adjustments for varying a level of the harmonic enhancing and for varying levels of different frequency bands within the harmonically enhanced audio signal and the warmth enhanced audio signal.

36. A method as claimed in claim 35 wherein the step of providing adjustments includes providing preset levels determined by an expert of the received digital decompressed audio signal.

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38. A method of distributing enhanced digital audio signals produced from compressed and decompressed digital audio signals, the method comprising the steps of

providing software for a digital signal processor including the steps of harmonically enhancing the digital decompressed audio signal to provide a harmonically enhanced audio signal, adding warmth to the digital decompressed audio signal to provide a warmth enhanced audio signal, and combining and frequency equalizing the harmonically enhanced audio signal and the warmth enhanced audio signal to provide a digital enhanced decompressed audio signal; and

providing adjustments within the software for varying levels of the harmonic enhancing and for varying levels of the frequency equalizing to provide the digital enhanced decompressed audio signal.

39. A method of distributing as claimed in claim 38 wherein the step of providing software includes the steps of providing the software free and providing in the software one of a one-time use, a partial use, a partially enhanced audio signal use, and non-save adjustments.

40. A method of distributing as claimed in claim 39 wherein the step of providing software further includes the steps of providing the software for a price and one of removing from the software the one of the one-time use, the partial use, the partially enhanced audio signal use, and the non-save adjustments and providing new software without the one of the one-time use, the partial use, the partially enhanced audio signal use, and the non-save adjustments.

40. A method of distributing as claimed in claim 39 wherein the step of providing software further includes the steps of providing the software for a price and one of removing from the software the one of the one-time use, the partial use, the partially enhanced audio signal use, and the non-save adjustments and providing new software without the one of the one-time use, the partial use, the partially enhanced audio signal use, and the non-save adjustments.

41. A method of distributing enhanced digital audio signals produced from compressed and decompressed digital audio signals, the method comprising the steps of

providing software for a digital signal processor including the steps of harmonically enhancing the digital decompressed audio signal to provide a harmonically enhanced audio signal, adding warmth to the digital decompressed audio signal to provide a warmth enhanced audio signal, and combining and frequency equalizing the harmonically enhanced audio signal and the warmth enhanced audio signal to provide a digital enhanced decompressed audio signal;

providing adjustments within the software for varying levels of the harmonic enhancing and for varying levels of the frequency equalizing to provide the digital enhanced decompressed audio signal;

providing the software free and including in the software one of a one-time use, a partial use, a partially enhanced audio signal use, and non-save adjustments; and

selling the software for a price without including in the software the one of the one-time use, the partial use, the partially enhanced audio signal use, and the non-save adjustments.

42. A method of distributing enhanced digital audio signals produced from compressed and decompressed digital audio signals, the method comprising the steps of

providing software for a digital signal processor including the steps of harmonically enhancing the digital decompressed audio signal to provide a harmonically enhanced audio signal, adding warmth to the digital decompressed audio signal to provide a warmth enhanced audio signal, and combining and frequency equalizing the harmonically enhanced audio signal and the warmth enhanced audio signal to provide a digital enhanced decompressed audio signal; and

providing adjustments within the software for varying levels of the harmonic enhancing and for varying levels of frequency equalizing to provide the digital enhanced decompressed audio signal, the adjustments being preset to levels determined by an expert of the received digital decompressed audio signal.

43. A method of distributing as claimed in claim 42 wherein the step of providing adjustments with preset levels determined by an expert of the received digital decompressed audio signal includes providing adjustments with preset levels determined by a performer that produced

the audio signals.

the audio signals.